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Conference Paper · October 2022

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Nationality Detection using Deep Learning

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Abstract. A new intelligent monitoring model is developed by us for determining gender and nationality from frontal picture candidates utilizing the face area based on deep learning. Face recognition is influenced by a number of characteristics, including picture quality, illumination, rotation angle, blockage, and facial expression. As a result, we must first recognize an input image before converting it to a genuine input. Nationality is the most well distinguishing characteristic that is applied in every nation and it is also important to secure authentication. Image detection is crucial in this case. Then, we can determine the facial shape, gender, and nationality of the candidate image. In the end, we return the result based on the distance comparison using the use of a library to measure the sample. There were significant discrepancies across photographs while measuring samples based on their gender and facial features. The photos used in the input must be the same as those used in the output. Picture of a frontal face with clean lighting and no blemishes at every angle of rotation. The model may be used by ordinary people, Models, celebrities, actors, and others. In the end, Computer can tell nationality by looking at a picture of a person's face.

Keywords: Face detection, Image Detection, Face shapes, Gender detection, Nationality recognition.

1 Introduction

Face recognition gives an outstanding possibility to grow a beneficial software to find out people's identity for the immigration and security workplaces in many countries. In face recognition modeling and processing the most important issue is to discover a solution for the act for faces that helps for different kinds of tasks regular

of human performance. Human facial expression is a complicated visual pattern that includes common categorical statistics in addition to eccentric, primary data, identity particular. by using these categorical facts, we are referring that some elements of a face are not particular to that specific face, however, is shared by way of a group of faces. These factors may be used to hire both unusual and acquainted faces to preferred semantic agencies such as place or nationality. Generally, computational patterns of face reputation constitute faces in phrases of geometric identifications that include angles, areas, and distances between base capabilities including mouth, nostril, eyes, or chin. At present, there are a few useful algorithms for identifying face candidate domain regions. Even though a few only work with the manual evaluation, others identify face areas. About the identification of nationality by face candidate, specifically research on detecting nationality have now not been researched but. to choose to this problem, first we've got gathered one thousand face images from each country.

2 Related Works

Mainly this system is workable in the plain background picture. Input picture enhanced histogram equalization besides detection based on multiple scales which is called extracted edges linked wing energy function and finally face control extracted applying detection information.[1].This research is based on face key points, face part color, size, and distance. Image quality, lighting, the facial expression also depends on it. They take real input then identify gender, face shape, key point then gives results. This result was found in the measurement database here the most important part is taking input image in frontal no rotation allows.[2], The main work of this paper is detecting human face using skin color also use here face shape and size. YCBCR and HSV have used the original pictures for quantized skin shade his period performs rapidly for finding face point. For doing this face processing a set of easy statistical deviations is created and also created a meaningful feature vector.[3], Because of using simile classifiers and attribute classifiers with LFW methods its error rates were reduced by 31.68%. The attribute classifiers like "Hair", "Skin", "Flash" and a total of 65 attribute classifiers could detect the visual appearance. Simile classifiers used a total of 60 numbers of people as a reference and it works on expression, pose, and illumination. For more inquire the PubFig dataset is included.[4], This paper worked on a new algorithm named "facial feature detection". It collected images from people ages between 2-85. For better accuracy, 4 different types of facial pose images were taken. They analyze eyes, lips, and chin from images. This paperwork could be used in facial surgery, age classification, race detection, and other facial feature-related fields.[5], This paper test residual nets using 152 layers. An examination of CIFAR-10 within 100 to 1000 levels is also presented.[6], Viola-Jones confront finder is utilized to identify the position of the AdaBoost calculation confront. Once more, the geometric proportion of the

confront is utilized to identify blunders within the confront and eyes. The bend of a cubic chime is utilized to decide to feel.[7], This paper uses here D -CNN method. we chose to propose an effective convolutional organized VGGnet design that can be utilized in extraordinary cases when the sum of training data utilized to learn D-CNN based on VGGNet design is restricted.[8], This study proposed developing an application that provides users permit to a certain machine depending on a thorough examination of facial features. This project will be built with OpenCV and MS NET framework from Microsoft.[9]. The system is made up of three parts and utilizes color pictures. Skin detection is implemented in the 1st module, which uses Markov random fields models for picture fragmentation and skin recognition. The 2nd module is in charge of detecting and extracting eyes and mouths. The 3rd module uses edge detection as well as measuring the variation of the eyes and mouth region figures to identify the emotions depicted in the eyes and lips.[10], In this paper, three labels were developed for an Arab picture dataset GCC, the Levant, and Egypt. The problem was solved using two methods of deep learning. When a pre-trained CNN was trained on the whole Arab dataset and then evaluated on a different dataset, the best result was 56.97 percent, and 52.12 percent when the Arab dataset labels were fairly distributed.[11], In this study, we used facial images to train a machine learning classifier to predict Chinese, Japanese, and Korean. Of all the approaches we provided, CNN had the greatest accuracy rate (89.2%)In the three-class categorization of the three different languages.[12], Computer vision can predict nationality based on a person's visual characteristics. This method has achieved an average of 93.6% accuracy with a very low misclassification rate, according to researchers at the University of Michigan.[13].The pre-trained method is used to minimize the dimensionality of the retrieved picture characteristics in a range of video frames so that meaningful and unusual events in the frame can be preserved. For the identification of abnormal circumstances at surveillance footage, the suggested technique is a hybrid of CNN and SVM architectures[14]. In addition, the utility of the deep learning approach for raising the applicability of picture identification with excellent testing performance has been reviewed when it comes to IoT image registration. Furthermore, the fundamental goal of this study project is to assemble a thorough survey data on the different kinds of IoT implementations, as well as security and privacy concern With a higher accuracy rate, privacy issues arise[15].

Paper name	Method name	Accuracy
[1] Jianguo Wang *, Tieniu Tan , A new face detection method based on shape information ,2000.	shape information using histogram equalization	the system can accurately locate 87.5% of the faces

Paper name	Method name	Accuracy
[2] Bat-Erdene Batsukh, Effective Computer Model For Recognizing Nationality From Frontal Image, 2016.	using face part color, size, and distances	86.4%
[3] C. Garcia, G. Tziritas, Face Detection Using Quantized Skin Color Regions Merging and Wavelet Packet Analysis ,1999.	YCbCr and HSV	94.23%
[4] Neeraj Kumar Alexander C. Berg Peter N. Belhumeur Shree K. Nayar, Attribute and Simile Classifiers for Face Verification ,2009.	“attribute” classifiers & “smile” classifiers were used	85.29%
[5] Azam Bastanfard, Melika Abbasian Nik, Mohammad Mahdi Dehshibi, Iranian Face Database with Age, Pose and Expression ,2007	Iranian Face Database (IFDB)	94.20%
[6] Kaiming He Xiangyu Zhang Shaoqing Ren Jian Sun, Deep Residual Learning for Image Recognition , 2015.	Deep Residual Learning	training error <0.1% test error 7.93%
[7] Rembiye KANDEMIRI, Gonca ÖZMEN2, FACIAL EXPRESSION CLASSIFICATION WITH HAAR FEATURES, GEOMETRIC FEATURES AND CUBIC BEZIER CURVES, 2013.	HAAR FEATURES, GEOMETRIC FEATURES, AND CUBIC BÉZIER CURVES	97%
[8] AmitDhomne, RanjitKumar, VijayBhan, Gender Recognition Through Face Using Deep Learning ,2018.	D-CNN based on VGG-Net	95%
[9] Shervin, Emami Valentin Petrut, Facial Recognition using OpenCV, 2012.	OpenCV and MS NET framework	95%
[10] Ilias Maglogiannis Demosthenes Vouyioukas Chris Aggelopoulos, Face detection and recognition of natural human emotion using Markov random fields ,2007.	Markov random fields	96.68
[11] A Classification of Arab Ethnicity Based on Face Image Using Deep Learning Approach.	CNN	75%

Paper name	Method name	Accuracy
[12] Where am I from? –East Asian Ethnicity Classification from Facial Recognitio.	CNN	89.2%
[13] A Convolutional Neural Network based Classification Approach for Predicting Nationality from Facial Feature	CNN	93.6%
[14] Design of Deep Learning Algorithm for IoT Application by Image based Recognition	Proposed CNN framework	97%
[15] An Efficient Dimension Reduction based Fusion of CNN and SVM Model for Detection of Abnormal Incident in Video Surveillance.	Hybrid proposed	90%

Table 1

3 Methodology

The human confront is a fantastic source of information for a variety of human social interactions. Identifying a human face for any country's citizens is a challenging task. However, employing machine learning to identify is now a far more viable option. In this case, machine learning seems to do a magical act. It assists us in identifying and distinguishing important human faces and expressions. Though it's a very critical term because individual confront are special. Face shape position and type, distance, key-point are not the same. We actually work here by keeping 4 different countries male and female. we collected human pictures considered as sample data. In our data set, we collect every country's public figure face. And our nominated countries are (Bangladesh, Pakistan, India (Tamil), Sri-lanka). we started our process by making architecture and here we applied CNN (Convolutional Neural Network) model. A convolutional neural network (CNN) is a kind of artificial neural network employed in image recognition and method that's specifically designed to process element data. CNNs are powerful image processes, AI (AI) that use deep learning to perform each generative and descriptive task, typically victimization machine vision that has an image and video recognition, in conjunction with recommender systems and language processing (NLP). A neural network is a system of hardware and/or code patterned once the operation of neurons within the

human brain. ancient neural networks aren't ideal for image processing and must be fed pictures in reduced-resolution pieces. CNN has their "neurons" organized additional like those of the frontal lobe, the space answerable for process visual stimuli in humans Associate in Nursingd alternative animals. The layers of neurons are arranged in such some way on cowl the complete field of regard avoiding the piecemeal image processing downside of ancient neural networks. A CNN uses a system very similar to a multilayer perceptron that has been designed for reduced processing requirements. The layers of a CNN encompass an input layer, an output layer, and a hidden layer that has multiple convolutional layers, pooling layers, fully connected layers, and normalization layers. The removal of limitations and increase in potency for image process results in a system that's much more effective, less complicated to trains restricted for image processing and language processing.

Basically, three main types of layers are used to build CNN (Convolutional Neural Network) architectures:

- Layers of convolution
- A layer of Pooling
- Layer with full connectivity.

Large features of a CNN are the first layer that can be recognized and outlined moderately simply. In this model at first take input and it must be the face of any person and here using a library which is Autocrop/developed tool. This model takes the image as input then is divided into different layers. Then lastly show the final output actually. Our given input is 4 countries for this reason 8 types of output are scanned. Data preprocessing is a very important and significant part of recognizing. CNN (Convolutional Neural Network) has a place to watch and direct the execution of our action in machine learning for which we need to label the data. We organized our dataset by using the mapping process. And grouping them 1,2,3,4,5,6,7,8 by name. Our data set is very large and this mapping makes this process easier than before. CNN algorithm takes an image as input then tests it made on a slandered dataset base for which this method works very fast and reliably. CNN is a class of Neural Networks that have vindicated exceptionally successfully in ranges. Such as image recognition and it has been compelling in recognizing objects, faces, and activity. Taking an image as input we have cropped the face using Autocrop tools. Then converted the image into numeric data and send data to the trained CNN model and get the highest Accuracy Result, Remap, and Index Data. Finally, we got our expected result.

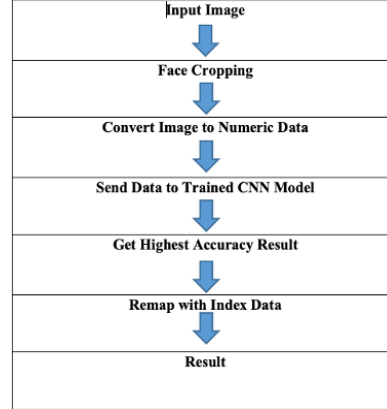


Figure 1: work Flowchart

3.1 Face detection and classification

Face detection is a concept that encompasses both face recognition and face detection. Face detection simply refers to a system's ability to recognize a human face in an image or video. In this paper, photos are auto-cropped and control points are extracted using the same segmentation methodology. Face cropping is usually done by hand, and the equations for obtaining a feature point are quite difficult. We used here a third-party library which is Autocrop. This library is quite beneficial. Our input data was filtered using it. It is simple to crop only the face of a photograph. At first, we filtered our all data. This is called leveling. create a CSB dataset where all data information is stored. Autocrop's unique feature is that all data is produced with the same height and width. we trained our dataset using the trained model and load there for creating a sequential model and this is our CNN model. For our detection result, we used a base size of 10 and trained 50 times. Finally, compile the model, set the history, and run the program step by step to achieve our aim.

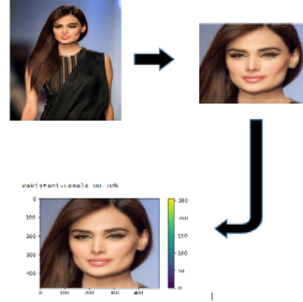


Figure 2: Face detection and classification.

3.2 Identifying gender

The picture candidate's gender was an interval exception while we were obtaining measurements from the sample photographs. Gender classification must have been used in real biological rules, particularly in anthropological and morphological analyses. One of the most problematic aspects of describing faces as a set of features is that it assumes some level of a priori knowledge. It's challenging to come up with a set of traits that can accurately be separated between male and female faces. Men and women were initially placed in separate folders when gender was determined. We worked for four separate countries (Bangladesh, Indian Tamil, Pakistan, and Sri Lanka) and synchronized those folders by number since we worked for men and women from four different countries. In our data set, we divided it into four categories: one for Bangladeshi males, two for Bangladeshi women, three for Pakistani men, and four for Pakistani women. Our dataset already knows this leveling and loading there for creating a sequential model and this model identifies gender by detecting that folder.

3.3 Recognizing nationality

A person's nationality is a well-known distinguishing trait that is utilized in every country for important verification purposes. The size and spacing of face parts are determined by a number of parameters, including picture quality and facial expression is the process of identifying nationality. As a result, we must first recognize a face in the image before converting it to a real-world input. The gender, facial shape, and portion of the face of the picture candidate may then be determined. Finally, we'll return the result, which will be based on our database's produced folder. There were significant variations between photos using these leveling folders when we were measuring samples. The frontal face image, with smooth illumination and

no rotation angle, must be used as the input image. We run a trained test on our model and provide a model summary. Finally, design a confusion matrix utilizing this accuracy. It actually aids us in detecting nationality and identifying similarities between people from other countries.

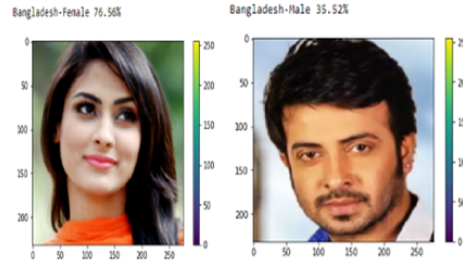


Figure 3: Bangladeshi Male and female.

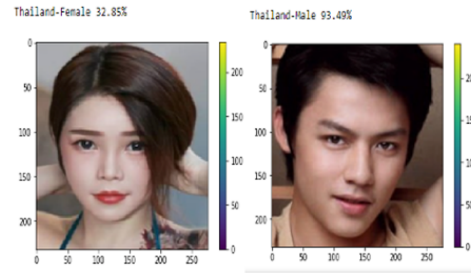


Figure 4: Thailand Male and Female.

4 Evaluation & Result

After collecting data, we used auto-crop to separate frontal face images from data for training. In our model, we have a total parameter of 3,380,440, the trainable parameter of 3,379,832, and the non-trainable parameter of 608. We trained our 10-batch data 50 times. Here some results are given below. Showing here some trained process. We know that the ratio of accurately expected data points among all the data points is called accuracy. In our 1st figure, it's clear that Our beginning accuracy level was not very good, so we trained it and now it has the highest accuracy. A loss is the result of a wrong prediction. When loss decrease, accuracy increase gradually.

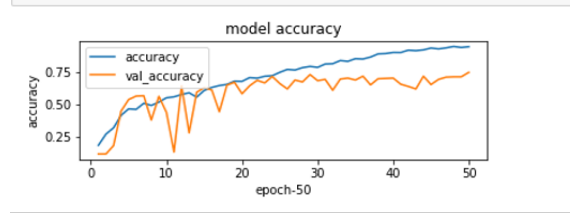


Figure 5:model accuracy

From the figure5, we observe accuracy rate keeps increasing in every step of training. And then we get up to 94.65% accuracy which is actually trained accuracy and 55.97% Val accuracy (value accuracy), which is acceptable.

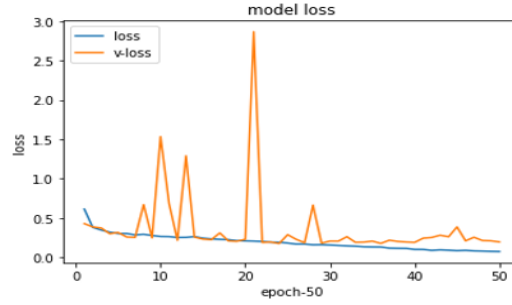


Figure 6: model loss

From the figure6, we can see from our loss- v-loss (validation loss) function graph, the loss is decreasing. which is 8.34%. When our data is trained, the validation loss is determined on the v-set (validation set).

5 Discussion & Conclusion

In this paper, we proposed a model that could detect the nationality and gender of people in a very simple and effective way using frontal images. In the first place, we need to train our system with some targeted data we want to detect. we have achieved up to 94% accuracy with our small dataset. This model is useful for frontal face color images and sufficient lighting conditions. With this model, we can identify people's nationalities easily. And it will be more effective if we train our system with a larger dataset. In a recent global world find out nationality is a challenging step. By detecting nationality immigration office, defense and government could make important decisions. It could be used in business modeling and online marketing.

This project is mostly employed in the field of social work. Persons may use it to detect the gender and nationality of people from any country. Our long-term objective is to transform it into an Android application. The Android application has become more user-friendly in recent years. It may be simple to use and comprehend. As a result, we plan to create an Android application in the future.

References

- [1] Wang, J. and Tan, T., 2000. A new face detection method based on shape information. *Pattern Recognition Letters*, 21(6-7), pp.463-471.
- [2] Batsukh, B.E. and Tsend, G., 2016. Effective Computer Model For Recognizing Nationality From Frontal Image. *arXiv preprint arXiv:1603.04550*.
- [3] Garcia, C. and Tziritas, G., 1999. Face detection using quantized skin color regions merging and wavelet packet analysis. *IEEE Transactions on multimedia*, 1(3), pp.264-277.
- [4] Kumar, N., Berg, A.C., Belhumeur, P.N. and Nayar, S.K., 2009, September. Attribute and simile classifiers for face verification. In *2009 IEEE 12th international conference on computer vision* (pp. 365-372). IEEE.
- [5] Bastanfard, A., Nik, M.A. and Dehshibi, M.M., 2007, December. Iranian face database with age, pose and expression. In *2007 International Conference on Machine Vision* (pp. 50-55). IEEE.
- [6] He, K., Zhang, X., Ren, S. and Sun, J., 2016. Deep residual learning for image recognition. In *Proceedings of the IEEE conference on computer vision and pattern recognition* (pp. 770-778).
- [7] Kandemir, R. and Özmen, G., 2013. Facial Expression Classification With Haar Features, Geometric Features And Cubic B-spline Curves. *IU-Journal of Electrical & Electronics Engineering*, 13(2), pp.1667-1673.
- [8] Dhommne, A., Kumar, R. and Bhan, V., 2018. Gender recognition through face using deep learning. *Procedia computer science*, 132, pp.2-10.
- [9] Emami, S. and Suci, V.P., 2012. Facial recognition using OpenCV. *Journal of Mobile, Embedded and Distributed Systems*, 4(1), pp.38-43.
- [10] Maglogiannis, I., Vouyioukas, D. and Aggelopoulos, C., 2009. Face detection and recognition of natural human emotion using Markov random fields. *Personal and Ubiquitous Computing*, 13(1), pp.95-101.
- [11] Al-Humaidan, N.A. and Prince, M., 2021. A classification of arab ethnicity based on face image using deep learning approach. *IEEE Access*, 9, pp.50755-50766.
- [12] Chen, H., Deng, Y. and Zhang, S., 2016. Where am i from?—east asian ethnicity classification from facial recognition. *Project study in Stanford University*.
- [13] Junayed, M.S., Jeny, A.A., Neehal, N., Ahmed, E. and Hossain, S.A., 2018, December. Incept-N: A Convolutional Neural Network Based Classification Approach for Predicting Nationality from Facial Features. In *International Conference on Recent Trends in Image Processing and Pattern Recognition* (pp. 466-475). Springer, Singapore.
- [14] Sharma, R. and Sungheetha, A., 2021. An efficient dimension reduction based fusion of CNN and SVM model for detection of abnormal incident in video surveillance. *Journal of Soft Computing Paradigm (JSCP)*, 3(02), pp.55-69.
- [15] Jacob, I.J. and EbbyDarney, P., 2021. Design of deep learning algorithm for IoT application by image based recognition. *J ISMAC*, 3(3), pp.276-290.